

A NEW SPECIES OF MONTANE PITVIPER
(SERPENTES: VIPERIDAE: *BOTHROPS*) FROM
COCHABAMBA, BOLIVIA

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Abstract.—*Bothrops jonathani* is a new species described from the Bolivian altiplano and adjacent xeric mountain sides, an area previously unknown to be inhabited by any species of pitviper. The new taxon is distantly allopatric from its most phenotypically similar congener *B. alternatus*. The new species is distinguished from other *Bothrops* by higher scale counts, relatively short hemipenial spines, a unique color pattern, and distinct prelacunal and second supralabial.

Many of the forty-one (Campbell & Lamar 1989, 1992) currently recognized species of South American crotalines are rarely collected and remain poorly known despite recent advances in their study. South American species formerly referred to *Bothrops* (sensu lato) were placed in five genera (Burger 1971, Pérez-Higareda et al. 1985, Campbell & Lamar 1989). Evidence that three of these genera are monophyletic has recently come from biochemical and anatomical characters (Werman 1992), while the same analysis showed that *Bothrops* (sensu Burger 1971) is polyphyletic if *Bothriopsis* is recognized. Within *Bothrops* (sensu stricto), evidence in support of two monophyletic lineages referred to loosely as the “*neuwiedi*” and “*atrox*” groups was provided (Werman 1992). However, these groups have yet to be formally defined or diagnosed.

Although several crotalines occur at high elevations in the Andes, most species inhabit cloud forest or wet, upper montane forest. Only two species, *Bothrops lojanus* and *B. ammodytoides* occur in relatively xeric habitats above 2000 m and no pitvipers are known from the altiplano of Peru, Bolivia, and Argentina. Incidental to research (Harvey & Smith 1993, 1994) in the

cis-Andean cloud forests of Santa Cruz and Cochabamba, Bolivia, a small herpetological collection was made in the altiplano and adjacent intermontane valleys of Cochabamba. Among material collected were two pitvipers herein described as a new species.

Methods

A string and meter stick were used to measure snout-vent length (SVL), tail length (TL), and tail circumference (TC) at the level of the sixth subcaudal. With a dial caliper, distances were measured to the nearest 0.1 mm from the antero-ventral corner of the skin surrounding the eye to the caudal border of the pit (EP), the antero-dorsal border of the skin surrounding the eye to the center of the nostril (EN), the caudo-dorsal to antero-ventral edges of the skin surrounding the eye (ED), and from the tip of the snout to the skin covering the caudalmost tip of the articular (HL). Nomenclature for the hemipenis is that of Dowling & Savage (1960). Scale counts of the new taxon were compared with ranges of other species reported by Campbell & Lamar (1989) and specimens examined in this study (Appendix).



Fig. 1. *Bothrops jonathani*, female paratype. UTA R-34564, SVL 540 mm. Photo by Eric N. Smith.

Bothrops jonathani, new species
Figs. 1–2

Holotype.—Museo de Historia Natural “Noel Kempff Mercado” (MNK) R-1000, adult male collected on Highway 4 on 17 Jan 1992 by M. B. Harvey, approximately 35 km N (by road) of El Empalme, Provincia Carrasco, Departamento de Cochabamba, approximately 2800 m (17°45’S, 65°00’W).

Paratype.—The University of Texas at Arlington (UTA) R-34564, adult female collected on 30 Dec 1991 by M. B. Harvey and E. N. Smith on Highway 4, 97 km S (by road) of Cochabamba, 3220 m.

Diagnosis.—*Bothrops jonathani* is distinguished from all other species of *Bothrops* by the following combination of characteristics: (1) prelacunal and second supralabial distinct; (2) high numbers of supralabials, intersupraoculars, and mid-body scale rows; (3) hemipenial spines two-thirds length of adjacent subcaudals; (4) anterior suprala-

bials with distinctive pattern; (5) paraventral spots diffuse; (6) gular stripes short.

Description of holotype.—Rostral subtriangular, about as wide as tall, about as wide as mental; nasal distinctly divided both above and below the naris; loreal single, bound dorsally by canthal; prefoveals 6/6; subfoveals in single row, increasing posteriorly to four rows of interoculars; postfoveals 2/2; lacunal not contacting supralabials; preoculars 2/2; upper preocular elongate and contributing anteriorly to canthus; lower preocular squarish; suboculars 2/2, the first teardrop-shaped, the second elongate and crescent-shaped; postoculars 2/2; supralabials 11/12; infralabials 14 (right side incomplete, see remarks), first pair contacting medially; mental much broader than long; chin shields elongate, contacting first three infralabials; gulars in five rows between chin shields and first ventral; seven rows of gulars separating first ventral from infralabials; two internasals; canthals 1/1,

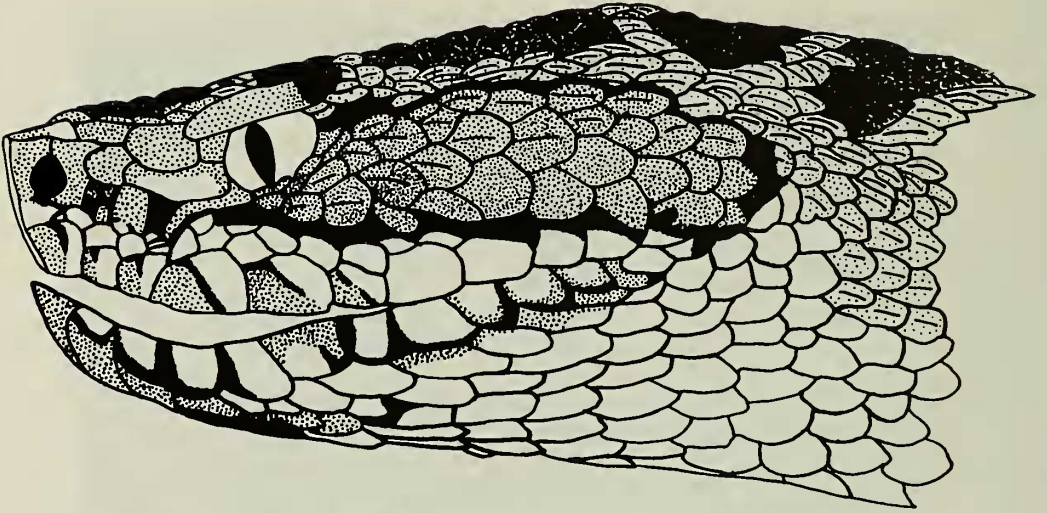


Fig. 2. Facial pattern of female paratype of *Bothrops jonathani*. UTA R-34564, Head Length 30.7 mm.

separated posteriorly by seven intercanthals; supraoculars about twice as long as wide, separated caudally by 10 intersupraoculars; dorsals 31–33–23; ventrals 166; anal entire; subcaudals 39, all divided; supra-anals seven; tail spine as long as adjacent five subcaudals; dorsals covering anterior 25% of tail spine.

Dorsal scales three times as long as wide anteriorly becoming wider posteriorly, only about 1.5 times as long as wide on tail; dorsal scales strongly keeled; paraventral row of scales smooth to very weakly keeled posteriorly, noticeably keeled on tail posterior to subcaudal 16; paravertrals about twice as wide as adjacent dorsal scales; most dorsal head and temporal scales strongly keeled; internasals, canthals, and supraoculars smooth; scale row dorsal to supralabials smooth.

Hemipenis (left): subcylindrical and bilobed; bifurcation of sulcus spermaticus at level of third subcaudal; bifurcation of lobes at sixth subcaudal; distribution of large to small keratinized spines asymmetrical on sulcate aspect of hemipenis, extending from level of first subcaudal along lateral surface, from level of third subcaudal on medial surface; largest spines on medial and lateral surfaces 2 mm or $\frac{2}{3}$ length of adjacent sub-

caudals; spines grading to finely papillate calyces at level of eighth subcaudal; papillae on calyces present only where ridges join; ridges of calyces extending medially to become lips of sulcus; lips of sulcus spinulate and papillate; asulcate surface of hemipenis covered in small and inconspicuous spines below bifurcation of lobes.

Color in preservative (ethanol after buffered formalin): Facial color pattern complex; broad, dark brown postocular band edged in black and extending from ventral and caudal borders of eye to enclose posterior border of supralabial 9, most of supralabials 10–12, and two scale rows caudal to the rictus, extending across the adjacent infralabials and four rows of gulars; white stripe anterior to postocular band and extending from ventral edge of supralabial 10 to subfoveal region and including part or all of supralabials 4–11; dorsocaudal corners of supralabials 1–6 white to grey; remainder of these scales dark tan; ventral border of prenasal white, edged in black; preocular, foveal, and nasal regions dark tan; ventral surface of head white with black and smoke-grey markings; smoke-grey stripes on gulars between chin shields and infralabials extending from level of infralabial 9 to include first 3 infralabials and mental; infralabials

Table 1.—Comparison of selected diagnostic characteristics of certain Bolivian and Argentinian *Bothrops*.

Characteristic	<i>B. jonathani</i>	<i>B. alternatus</i>	<i>B. neuwiedi</i>	<i>B. ammodytoides</i>
Supralabials	9–12	8–10	7–10	8–11
Intersupraoculars	10–12	8–13	6–9	7–11
Mid-body scale rows	30–33	24–37	21–29	23–25
Subfoveal row of scales	present	present	absent	absent
Rostral	normal	normal	normal	elongate
Lengths of hemipenial spines	$\frac{2}{3}$ subcaudals	$\frac{2}{3}$ subcaudals	> 1 subcaudal	not examined
Gular stripes	short	long	short or absent	short
Anterior supralabials	patterned	without pattern	without pattern	without pattern
Paraventral spots	diffuse, not on ventrals	defined, over- lapping ventrals	diffuse to some- what defined, over- lapping ventrals	very diffuse, overlapping ventrals

10–12 grey; other infralabials white and edged in black; most white gulars edged in black posteriorly, rarely immaculate.

Ground coloration of ventrals white; a smoke-grey ventral pattern beginning anteriorly as a medial stripe on first 20–30 ventrals but becoming many, staggered bands posteriorly; ventrals mostly smoke-grey caudally; subcaudals mostly smoke-grey becoming uniformly smoke-grey by subcaudal 27; tail spine smoke-grey.

Dorsal ground coloration dark tan; 34 pairs of large, dark brown blotches edged in cream meeting or staggered mid-dorsally; mid-dorsal blotches mostly rectangular, but C-shaped caudally; 49 small, dark brown blotches on flanks and sides of tail; most anterior blotches occupying dorsals 6–9 and 12–22; about 80 diffuse black blotches covering paraventrals and dorsals 1–2, but paraventrals and dorsals 1–2 never completely black; large medial blotch occupying most of frontorostrals; parallel dark stripes beginning on posterior $\frac{1}{3}$ of supraoculars and extending caudally onto neck.

Variations.—The female paratype is similar to the holotype with some noteworthy differences. The nasals are not completely separated dorsal to the nares. A large preocular is divided into two scales, and the smaller preocular is fused to the supralabial. There are 5/5 prefoveals, no postfoveals, 5/3 suboculars owing to fragmentation of the crescent-shaped subocular, 3/3

postoculars, 9/11 supralabials, 13/14 infralabials, 8 intercanthals, 12 intersupraoculars, 28–30–21 dorsals, 175 ventrals, 37 subcaudals, and 26 dentary teeth. (Palatine and pterygoid teeth were not counted.) The tail spine is laterally compressed but bluntly rounded rather than pointed and 1.5 times as wide as the tail spine of the holotype.

Dorsal and ventral colors of the paratype are similar to those of the holotype although some differences in pattern exist. A broad postocular stripe reaches the rictus, but does not extend onto the infralabials and gulars as in the holotype. Parallel stripes on the top of the head are broken into four blotches, a pair covering the caudal one-third of the supraoculars and 6/5 intersupraoculars, two pairs in the parietal and occipital regions, and two crescent shaped blotches on the neck. There are 30 mid-dorsal blotches and 49 lateral blotches, with the first blotches occupying dorsals 5–9 and 11–21.

Measurements: (Measurements of holotype followed by those of paratype in parentheses) SVL 540 (540), TL 80 (60), TC 41 (28), HL 32.7 (30.7), EP 2.5–1.8 (1.8–1.9), EN 6.6–6.6 (6.3–6.4), ED 3.5–4.0 (3.8–4.0).

Remarks.—The holotype had been run over by an automobile damaging the head so that measurements from the eye to the pit and the eye diameter are approximate. The caudalmost supralabials have been lost

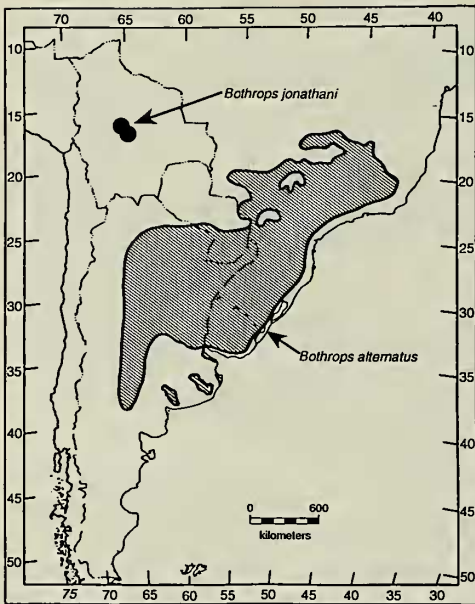


Fig. 3. Distribution of *Bothrops jonathani* and its presumed closest relative, *B. alternatus*. (Distribution of latter species after Campbell & Lamar 1989.)

on the right side; only twelve remain. Some teeth may be missing, but 4 palatine, 12 pterygoid, and 16 dentary teeth remain.

Distribution.—*Bothrops jonathani* is known from two localities at 2800 and 3220 m in Cochabamba (Fig. 3). Low, xeric-adapted shrubs cover the rocky hillsides where the holotype was found dead on the road. The paratype came from an area typical of the Bolivian altiplano: a dry, rocky grassland, largely devoid of bushes except around dry stream beds. Both specimens were found on sunny days in the afternoon. Air temperature was 27°C when the paratype was collected.

Etymology.—The specific epithet is a patronym for Jonathan A. Campbell in recognition of his considerable contributions to the biology of neotropical pitvipers.

Comparisons.—*Bothrops jonathani* is most similar to *B. alternatus*. In addition to having fewer supralabials, *B. alternatus* exhibits a distinctive color pattern that readily distinguishes it from *B. jonathani*. In *B. alternatus*, stripes extending from the mental

reach the level of the ventrals or, more often, to the angle of the jaw. These stripes extend only about two-thirds as far in *B. jonathani*. The first six supralabials of the new species are dark brown, but edged dorso-caudally in white to pale grey (Fig. 2); whereas, the same scales in *B. alternatus* are either uniformly pale or diffusely pigmented but always lack a definite pattern. In *B. alternatus*, the postocular stripe is edged dorsally in cream. However, the postocular stripe grades abruptly to the dark tan ground coloration of the dorsum in *B. jonathani*. Finally, *B. alternatus* has a row of well defined spots on the lateral edges of the ventrals, the paraventrals, and one to two rows of dorsals above the paraventrals. In *B. jonathani*, these ventrolateral spots are diffuse and do not extend onto the ventrals.

Most scale counts are higher in *B. jonathani* than in either *B. neuwiedi* or *B. ammodotyoides* (Table 1). Additionally, *B. ammodotyoides*, and *B. neuwiedi* lack a row of subfoveals. In *B. ammodotyoides* the rostral is vertically elongated so that the snout is upturned; a normal rostral occurs in the other species. Finally, in *B. neuwiedi* the largest hemipenial spines are two to three times as long as those of *B. jonathani*.

Five additional species of *Bothrops* occur in Bolivia, but are unlikely to be confused with *Bothrops jonathani*. The wet forest inhabitant *B. microphthalmus* differs from the former by having transverse cross-bands and by usually lacking a dorsal head pattern. Numbers of intersupraoculars, supralabials, infralabials, and mid-body scale rows are lower in *B. microphthalmus* than in *B. jonathani*. *Bothrops atrox*, *B. brazili*, *B. jararacussu*, and *B. sanctaerucis* possess lacunal labial scales, whereas *B. jonathani* possesses a distinct lacunal and second supralabial. As for *B. microphthalmus*, these species generally possess fewer numbers of intersupraoculars, supralabials, infralabials, and mid-body scale rows.

Within Bolivia, *Bothrops jonathani* is likely only to be confused with *B. neuwiedi*. However, the considerably more similar

species *B. alternatus* reaches northern Argentina and may eventually be found in Bolivia (Fig. 3). Neither *B. alternatus* nor *B. newwiedi* have been reported above 700 m and are almost certainly not sympatric with *B. jonathani*. *Bothrops newwiedi* often occurs in dry areas, similar in this respect to the rain-shadow valleys and dry altiplano where *B. jonathani* occurs; but *B. alternatus* is found in deciduous forests and often associated with swampy areas, riparian situations, and generally more mesic habitats (Campbell & Lamar 1989) than the dry grasslands and desert scrub where *B. jonathani* was collected. Finally, a third similarly patterned species could eventually prove to be sympatric with *B. jonathani*. *Bothrops ammodytoides* also occurs in areas of montane desert scrub and reaches elevations of 2000 m in the Andes of Argentina (Campbell & Lamar 1989).

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Appendix

Specimens Examined

Specimens examined are followed by collection locality in parentheses. Abbreviations refer to American Museum of Natural History (AMNH), Chicago Field Museum of Natural History (FMNH), Harvard Mu-

scum of Comparative Zoology (MCZ), National Museum of Natural History (USNM), the Museo de Historia Natural "Noel Kempff Mercado," Santa Cruz, Bolivia (MNK), the University of Texas at Arlington Collection of Vertebrates (UTA).

Bothrops alternatus (25): BRAZIL: Rio Grande do Sul; UTA R-32427. São Paulo; FMNH R-2620, 171265, 171272, 171281-82, 171289, 171298. SE Brazil; MCZ R-17734, 17748-51. PARAGUAY: Central; UTA R-2848, 5602, 7484-85, 7573, 9721. URUGUAY: Cerro Largo; FMNH R-12344. Treinta y Tres; FMNH R-10595. UNKNOWN (reportedly from Argentina): UTA R-4999, 6306, 6789. UNKNOWN: UTA R-32420.

Bothrops ammodytoides (10): ARGENTINA: Buenos Aires; FMNH 10830, 10832. ARGENTINA: Chubut; MCZ 150292. La Roja; USNM 73421. ARGENTINA: Mendoza; FMNH 9994, MCZ 58104-07. San Luis; UTA R-16334.

Bothrops microphthalmus (1): ECUADOR: Zamora; UTA R-23530.

Bothrops neuwiedi (19): ARGENTINA: Tucumán; FMNH 229950. BOLIVIA: Santa Cruz; AMNH 36008-09, MNK 124, 168, 178, 189, 197, 475. BRAZIL: Goiás; UTA 28232. Minas Gerais; FMNH 171255. Paraná; MCZ 112528. São Paulo; FMNH 171277, MCZ 112526. PARAGUAY: UTA R-2849, 5603, 9834-35. URUGUAY: Lavelleja; 7601.